

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-45

Survey Location: Spearfish Creek

County: Lawrence

Survey Dates: July 22 – 25, 2013

INTRODUCTION

The Spearfish Creek fish populations were surveyed in late July of 2013. A total of eight historical sites were chosen for annual monitoring of Spearfish Creek (Figure 1). Annual monitoring of specific sites is used to aid in identifying any changes in the fish populations residing in Spearfish Creek. Stream site conditions can vary temporally and, subsequently, site location can vary slightly from year to year.

Intensive surveys are also conducted on Spearfish Creek but are completed every three to five years, or as needed (determined by angler concerns or monitoring results) to better determine structure of fish populations. An intensive survey of Spearfish Creek (which involves random site selection) was last completed in 2011.

Spearfish Creek has been divided into six segments based on morphologic and hydrologic stream characteristics (Bucholz and Wilhite, 2008). During the 2012 survey two sites were surveyed in Segment 1 (SFC189 and SFC220), no sites were surveyed in Segment 2 (limited water in this segment), two sites were surveyed in Segment 3 (SFC354 and SFC406), two sites were surveyed in Segment 4 (SFC490 and 522), one site in Segment 5 (SFC585), and one site in Segment 6 (SFC636) (Figure 1). The sites surveyed varied slightly in chemical and physical characteristics (Appendix A).

SURVEY METHODS

The 2013 survey of Spearfish Creek was conducted using three pass depletion electrofishing. Efforts were made to satisfy the assumptions: 1) the population is static, 2) capture probability remains constant across sampling periods, and 3) all fish in the population are equally vulnerable to capture (Van Den Avyle and Hayward 1999; Hayes et al. 2007). Each site was enclosed with a top and bottom block net in an attempt to eliminate fish from emigrating out of or immigrating into the site. Three electrofishing passes were completed covering the entire 100 m section (including all available habitats), and collected fish were kept in holding cages situated outside the site. Collected fish are anesthetized, identified by species, and weighed (g) and measured (mm). The fish are then placed back into holding cages to recover. Once the fish have fully recovered they are released back into the stream.

Data are entered into Coldstream database. The Coldstream database was used to calculate parameters such as population estimates of fish per 100 meters and estimated numbers of fish per acre. Calculations are based on depletion of fish numbers in each pass. Microsoft Excel was utilized for other fisheries parameters such as length frequency histograms. During intensive surveys such as the 2011 survey, including random site selection, data was presented as fish population estimates per stream segment. However, the 2013 survey was merely a monitoring survey of historical sites,

and therefore, the data is presented as populations in specific sites. Length frequency histograms were also representative of specific sites, and age-0 fish (identified as the first mode break in the histogram) were not included in the histogram as some fish were measured and some were bulk counted. Site characteristic data such as mean stream width, pH, conductivity, and temperature were collected during the survey as well (Appendix A).

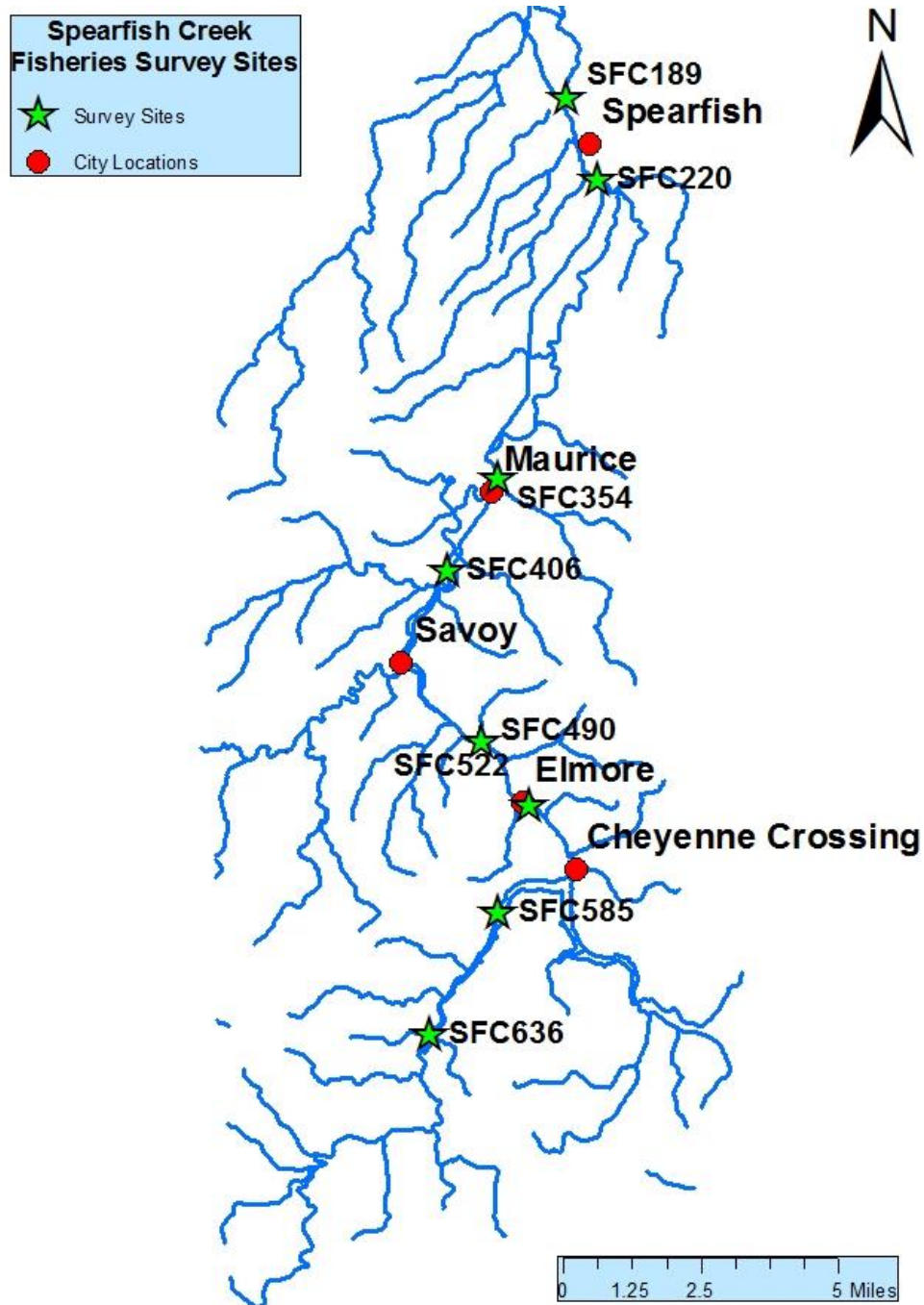


Figure 1. Spearfish Creek fisheries survey site locations 2013.

RESULTS AND DISCUSSION

Spearfish Creek has self-sustaining sportfish populations of Brown Trout *Salmo trutta*, Brook Trout *Salvelinus fontinalis*, and Rainbow Trout *Oncorhynchus mykiss*. Management options for Spearfish Creek are as Wild Trout/Natural Yield for Brown Trout and Brook Trout and as Wild Trout/Unique for Rainbow Trout. During the 2013 survey of eight historical sites on Spearfish Creek, four fish species were encountered and collected: Creek Chub *Semotilus atromaculatus*, Brook Trout, Brown Trout and Rainbow Trout. Until the 2013 survey, only salmonids have been found within Spearfish Creek during the fishery surveys.

Age data (physiological structures) was not collected from any of the fish species. However, younger fish, ages 0 to 2 may be apparent as modes in the length frequency histograms in the Summary by Site section. Some of the modes are clear and others are not; therefore ages were not assumed in the report, but rather that multiple age classes are present and recruitment is occurring.

Summaries by species

Brown Trout

Spearfish Creek has a considerable Brown Trout population with all eight sample sites in 2013 containing a Class 1 Brown Trout fishery (≥ 150 fish per acre) (Figure 2). The population of Brown Trout ≥ 200 mm (8 in) per 100 m has increased in three and decreased in three of the eight individual sites from 2012 to 2013 (Figure 3). The population stayed close to the same in the other two sites (Figure 3). Population estimates for Brown Trout < 200 mm have varied from year to year and there are large confidence intervals for some sites during particular survey years (Figure 4).

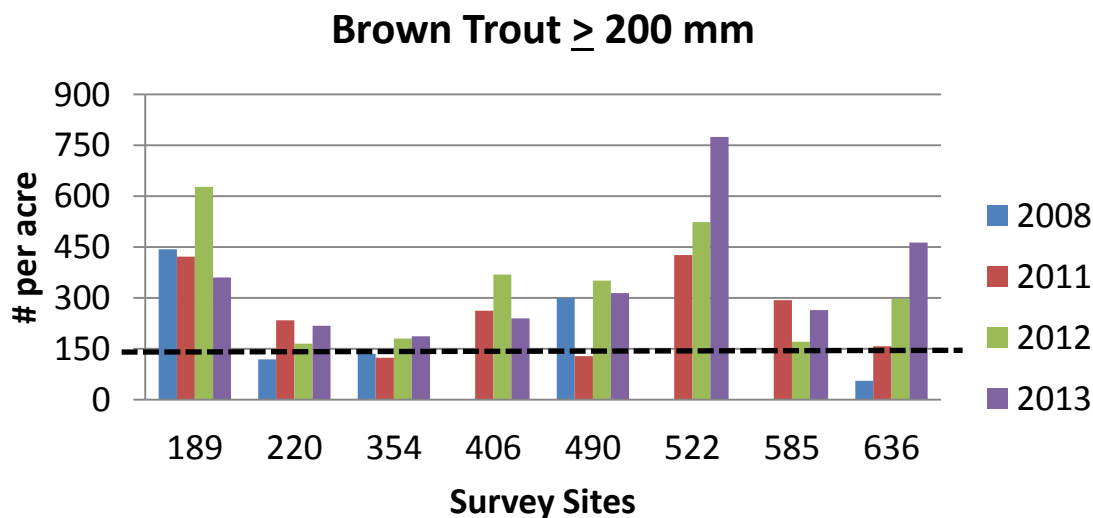


Figure 2. Spearfish Creek Brown Trout ≥ 200 mm number per acre in 2008, 2011, 2012 and 2013 by individual survey sites.

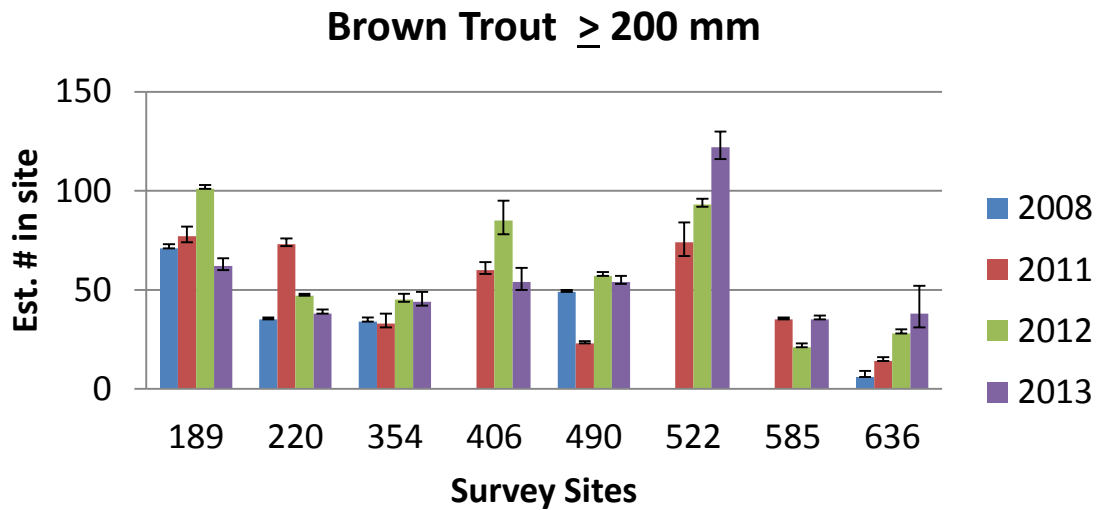


Figure 3. Spearfish Creek Brown Trout ≥ 200 mm population estimate by 100 m stream site in 2008, 2011, 2012 and 2013.

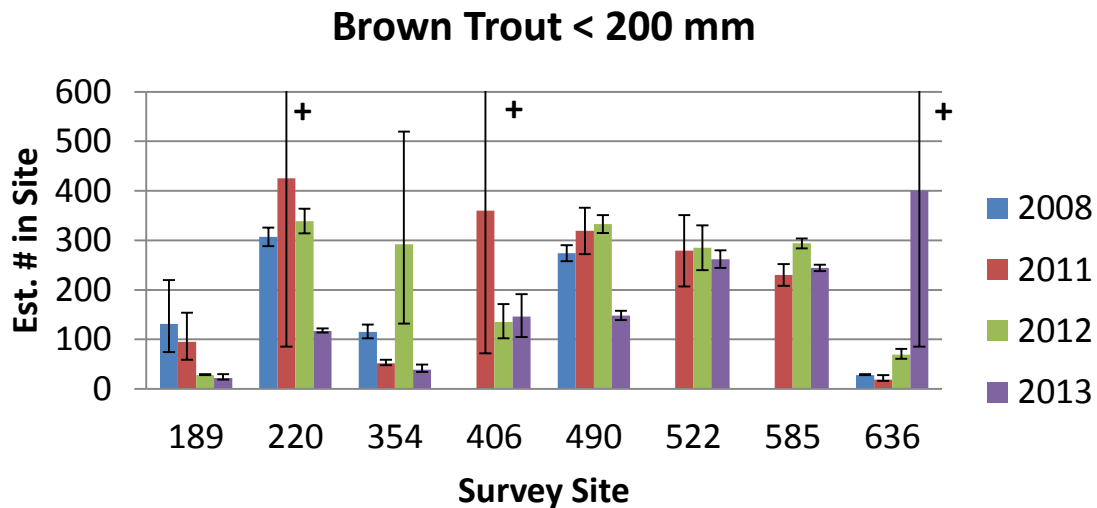


Figure 4. Spearfish Creek Brown Trout < 200 mm population estimate by 100 m stream site in 2008, 2011, 2012 and 2013.

Brook Trout

Brook Trout were found in two sample sites in 2013 with the greatest numbers found in site 636 near the headwaters (Figures 6 and 7). The number of large (≥ 200 mm) Brook Trout at site 636 had met criteria for listing as a Class 1 Brook Trout fishery in 2012, but has since decreased to slightly under a 150 fish per acre in 2013 (Figure 5). The population of Brook Trout ≥ 200 mm had increased from 2011 to 2012, but has also decreased slightly from 2012 to 2013 (Figure 6). The population of Brook Trout less than

200 mm has decreased from 2012 to 2013 as well, but the results are not substantial as the confidence intervals overlap (Figure 7).

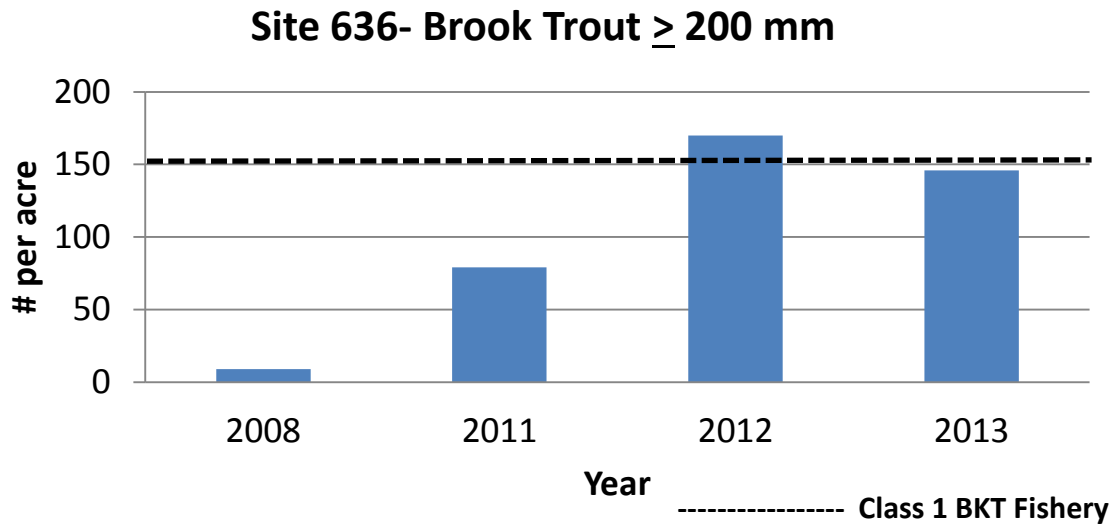


Figure 5. Spearfish Creek site 636 Brook trout \geq 200 mm estimated number of fish per acre by survey year.

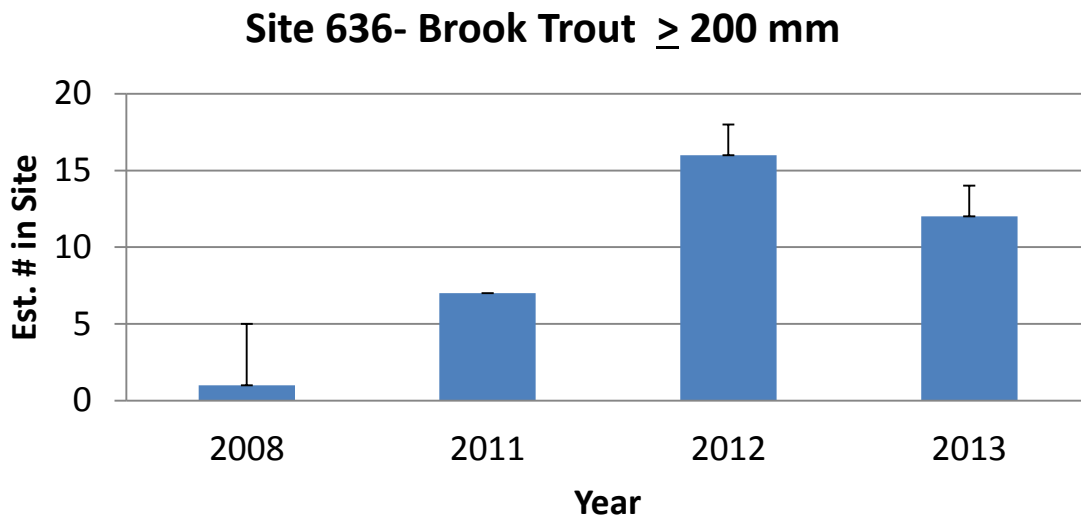


Figure 6. Spearfish Creek site 636 Brook Trout \geq 200 mm population estimate by survey year.

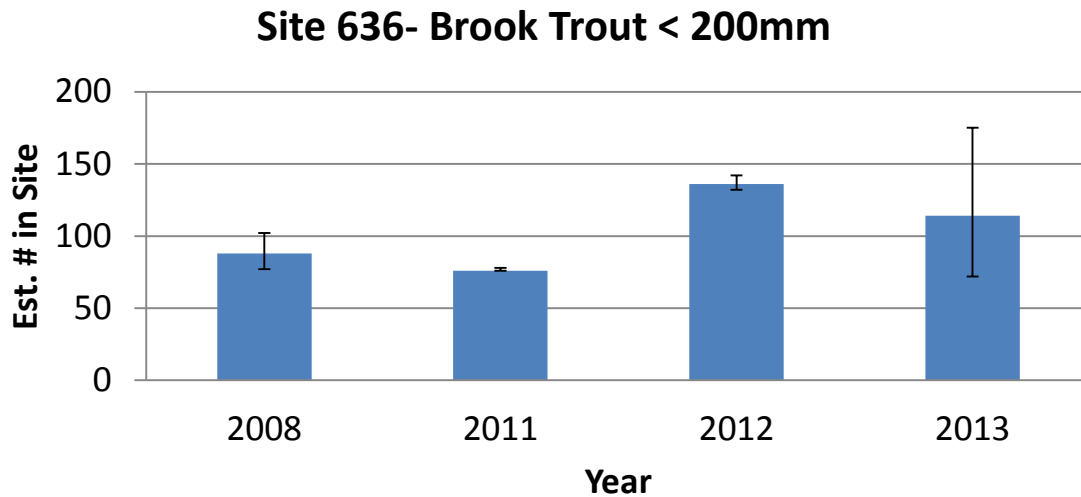


Figure 7. Spearfish Creek site 636 Brook Trout <200 mm population estimate by survey year.

Rainbow Trout

Rainbow Trout were found in site 354 in all of the last 3 surveys (Figures 9 and 10). There were high numbers of Rainbow Trout <200 mm in site 354 in 2012 (Figure 10). However, the numbers of Rainbow Trout <200 mm and ≥ 200 mm decreased from 2012 to 2013 with the Rainbow Trout <200 mm being the largest decrease. Rainbow Trout were only found in site 354 during the 2012 survey, and were found in Site 354 and 220 in 2013. The highest population estimate for Rainbow Trout ≥ 200 mm in site 354 was in 2008, but the estimate is confounded by large confidence intervals (Figure 7).

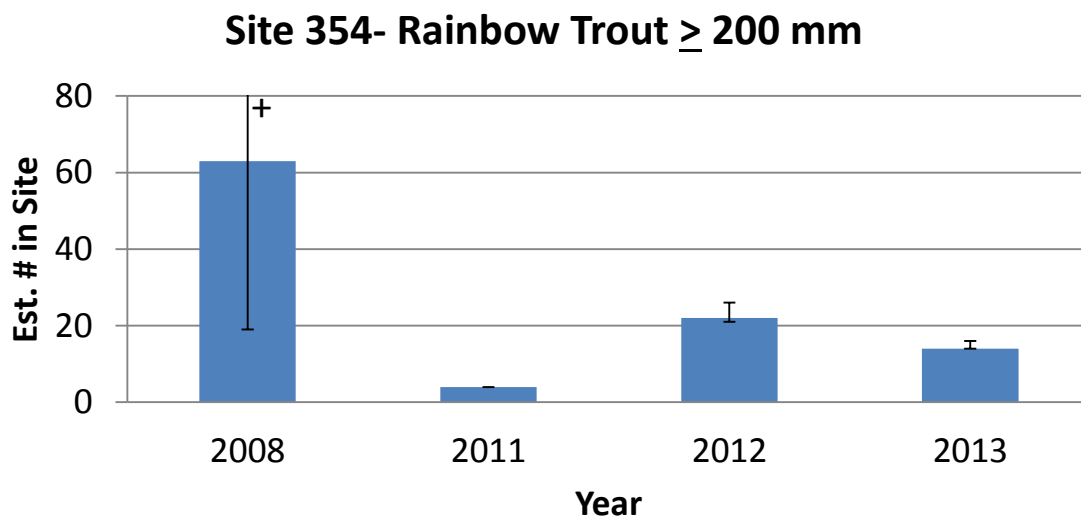


Figure 8. Spearfish Creek site 636 Rainbow Trout ≥ 200 mm population estimate by survey year.

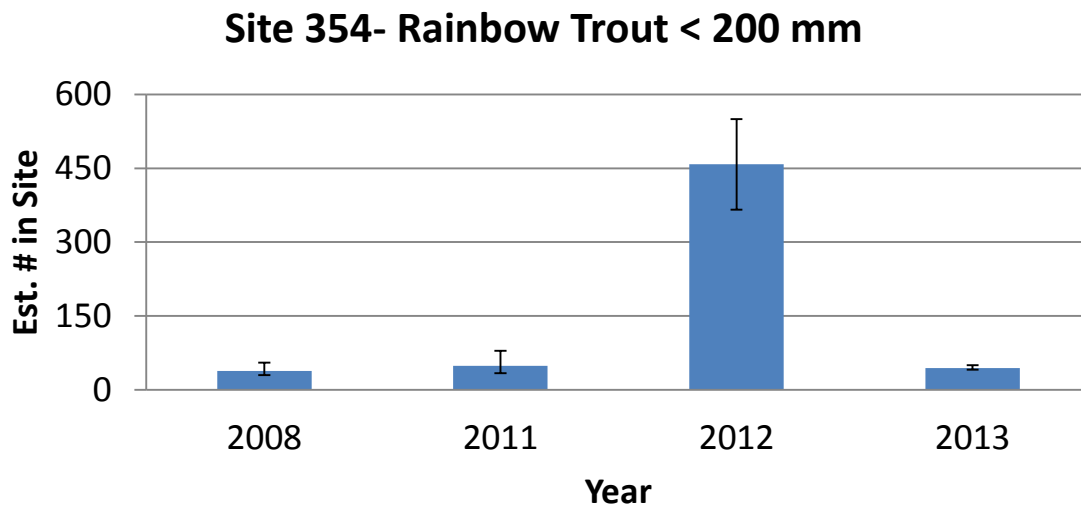


Figure 9. Spearfish Creek site 636 Rainbow Trout <200 mm population estimate by survey year.

Summaries by site

Site 189 (West of Spearfish high school)

Site 189 is a historical survey site on Spearfish Creek located in the town of Spearfish, west of the high school (Figure 10). Site 189 was surveyed on July 22, 2013. The site is characterized by abundant larger Brown Trout (≥ 200 mm), and lower numbers of small Brown Trout (Figures 3 and 4). The majority of the fish collected at Site 189 during the past three surveys have been Brown Trout. However, Rainbow Trout were collected in 2008 and 2011, and a Creek Chub was collected in 2013. Recruitment appears to be consistent and there appears to be several year classes of Brown Trout present in all of the past three surveys (Figures 11-14). Many of the Brown Trout are over quality length with a large portion exceeding preferred length as well (Figures 11-14). In 2012, there were a couple of Brown Trout exceeding memorable length (308 mm; 15 in) (Figure 13).

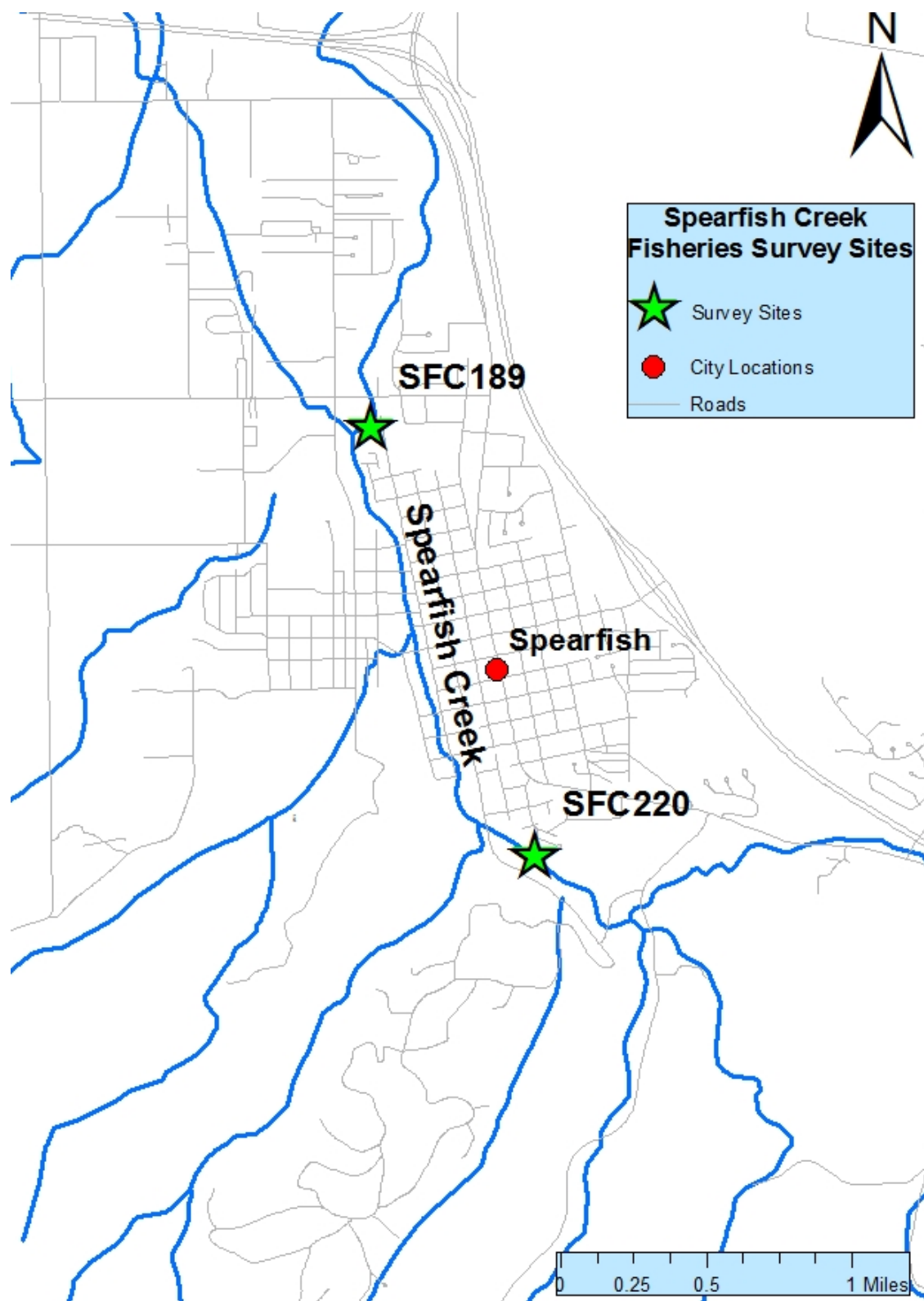


Figure 10. Spearfish Creek fisheries survey sites 189 & 220, 2013.

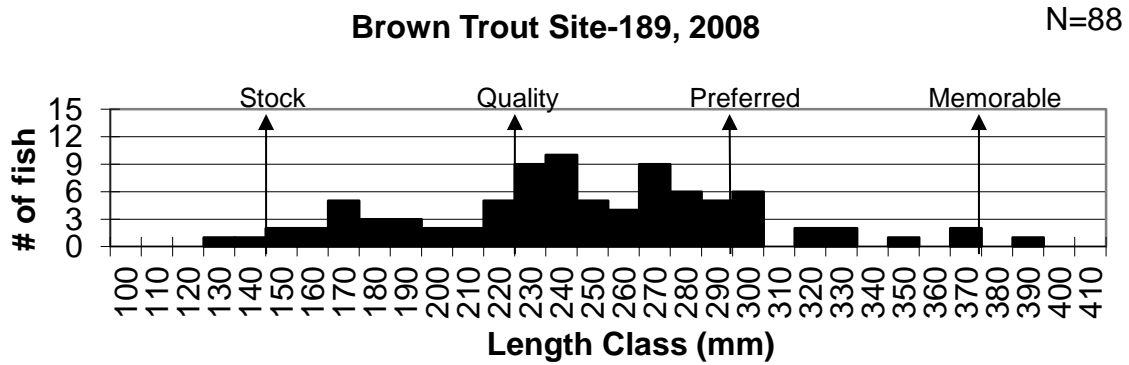


Figure 11. Brown Trout length frequency histogram for Spearfish Creek Site 189, 2008.

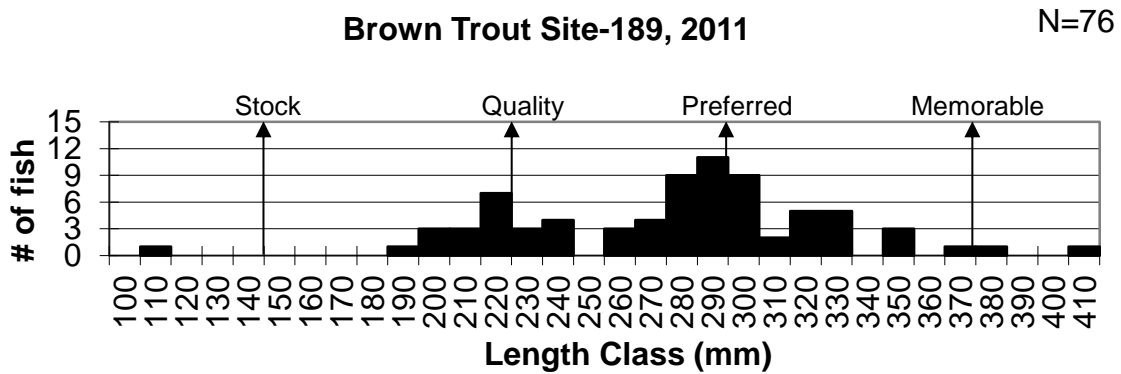


Figure 12. Brown Trout length frequency histogram for Spearfish Creek Site 189, 2011.

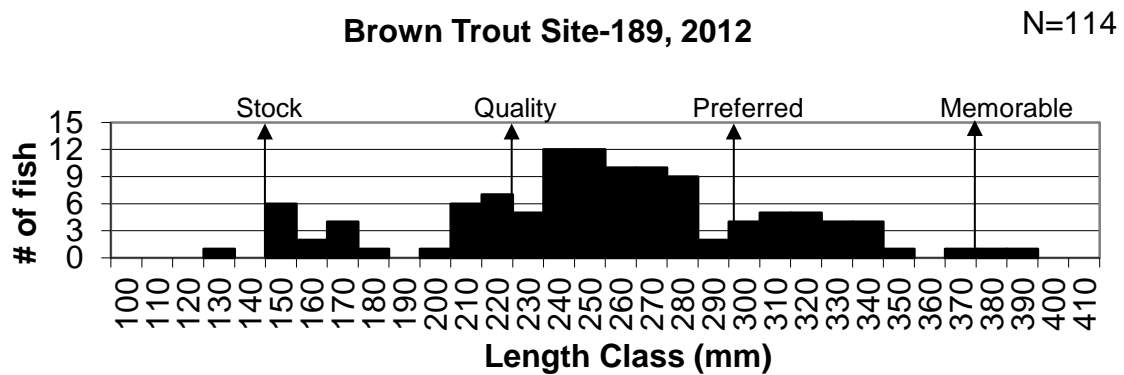


Figure. 13. Brown Trout length frequency histogram for Spearfish Creek Site 189, 2012.

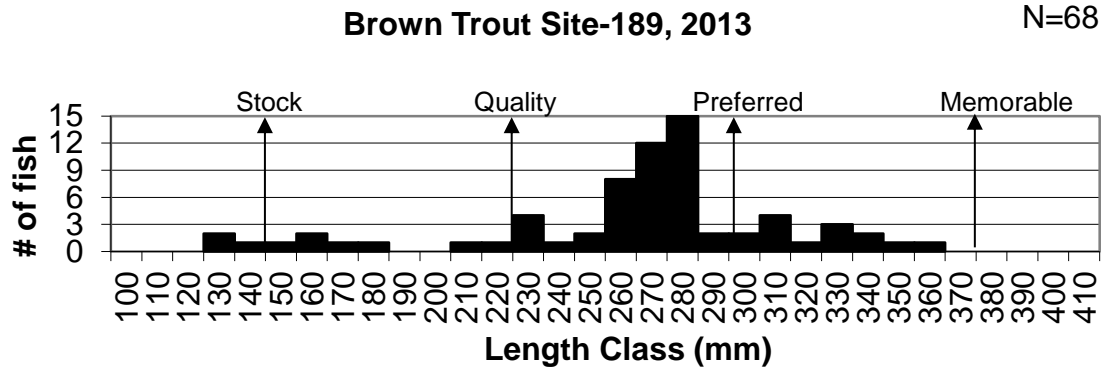


Figure 14. Brown Trout length frequency histogram for Spearfish Creek Site 189, 2013.

Site 220 (Spearfish campground)

Site 220 is a historical site in the town of Spearfish along the border of the city campground (Figure 10). Site 220 was surveyed on July 22, 2013. During the past three fisheries surveys only Brown Trout have been collected at this site. Small Brown Trout (<200 mm) are abundant in this site (Figure 5). However, high flows during the spring of 2013 have caused the main creek channel to divert to the side channel leaving the original channel bare in part of the site.

There appears to be consistent recruitment in this site as several year classes are visible on the length frequency histograms (Figures 15-18). A large proportion of the Brown Trout are over quality length with a few fish exceeding preferred length (Figures 15-18). At this site the abundance of Brown Trout ≥ 200 mm decreased slightly each year during the past three survey years (Figure 3).

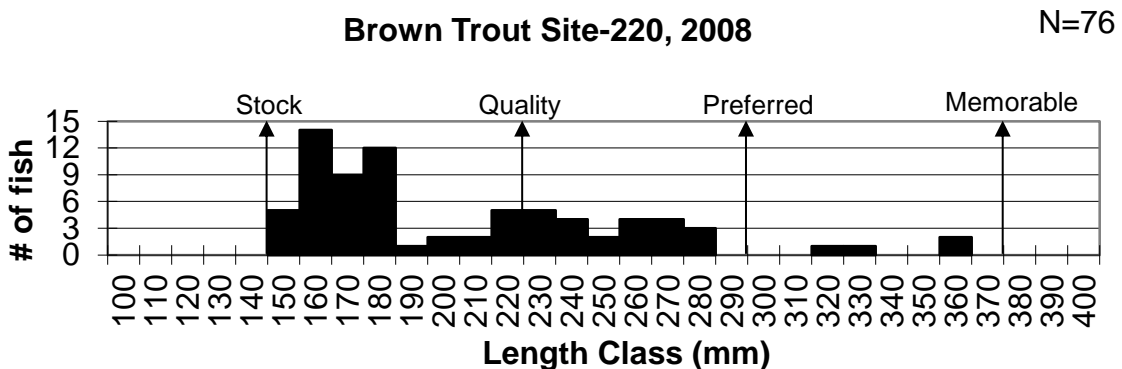


Figure 15. Brown Trout length frequency histogram for Spearfish Creek Site 220, 2008.

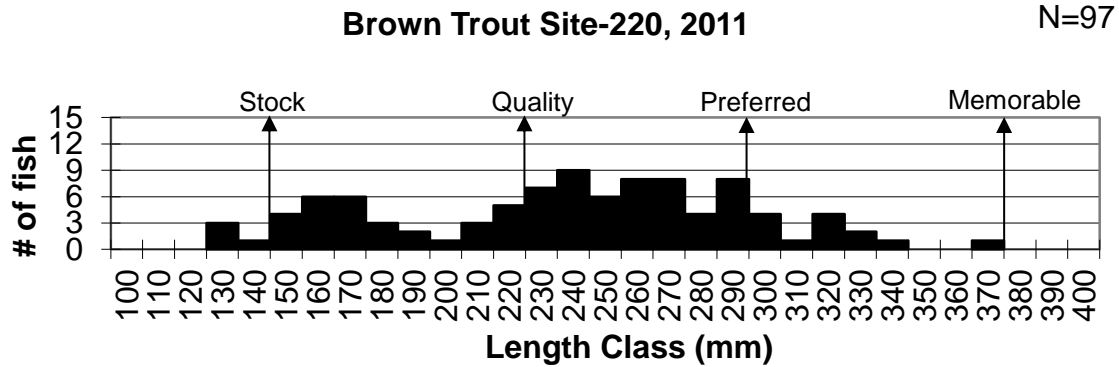


Figure 16. Brown Trout length frequency histogram for Spearfish Creek Site 220, 2011.

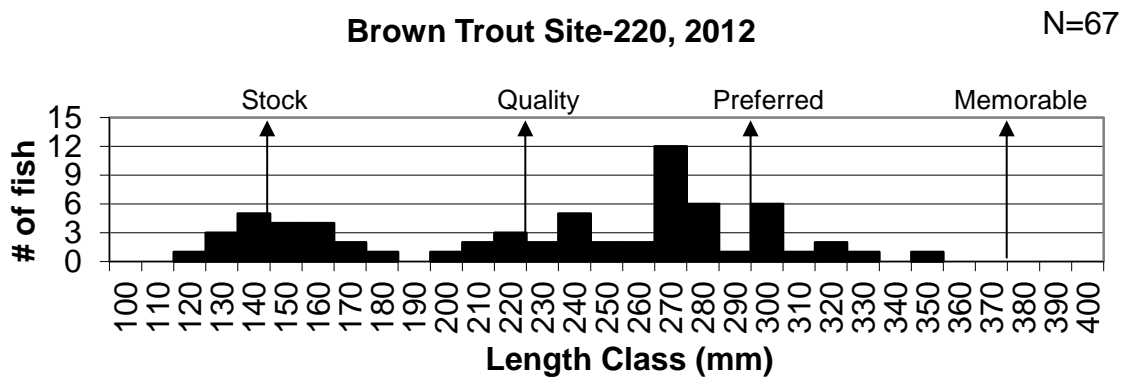


Figure 17. Brown Trout length frequency histogram for Spearfish Creek Site 220, 2012.

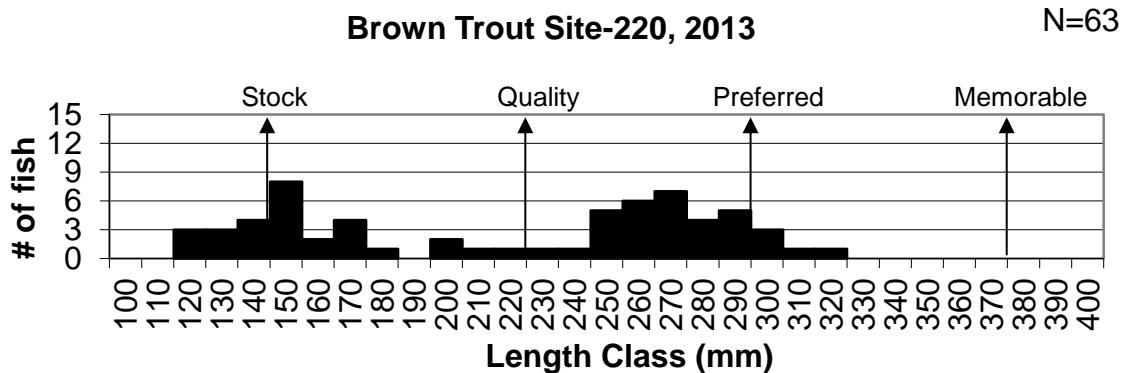


Figure 18. Brown Trout length frequency histogram for Spearfish Creek Site 220, 2013.

Site 354 (Confluence of Cleopatra Creek)

Site 354 is a historical site located at the confluence of Spearfish Creek and Cleopatra Creek just north of Maurice (Figure 19). Site 354 was surveyed on July 24, 2013. This site contains a self-sustaining population of Brown and Rainbow Trout. There appears to

be consistent recruitment of the Brown Trout population; however, very few fish exceed preferred length at this site (Figures 20-23).

In addition to the Brown Trout there is also a reproducing population of Rainbow Trout in Site 354 (Figures 8 and 9). However, in Site 354 in particular, there has not been many Rainbow Trout collected over quality length during the past three surveys (Figures 24-27). There continues to be good recruitment of Rainbow Trout at site 354 as there was large year class under stock length in the 2013 survey (Figure 27).

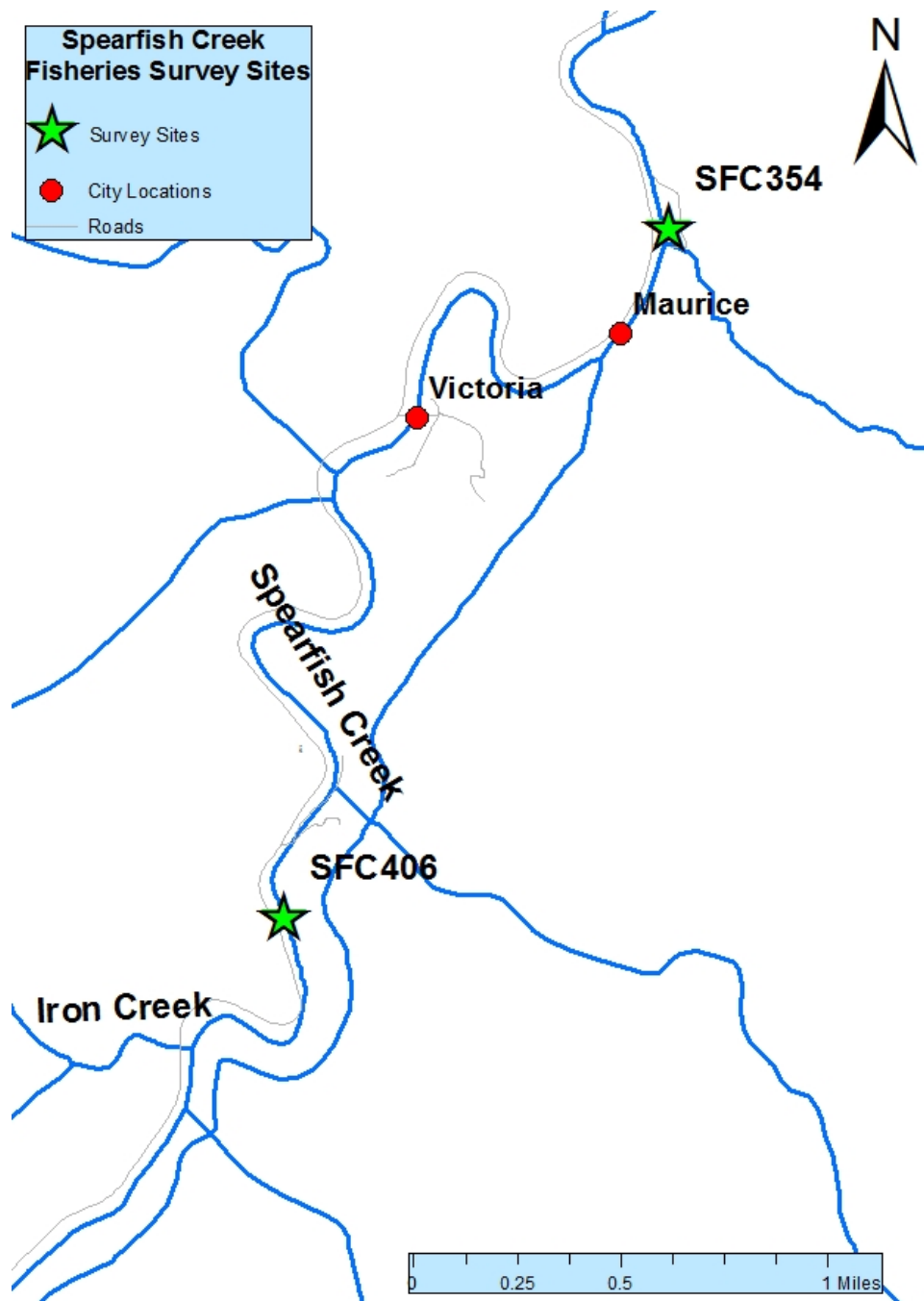


Figure 19. Spearfish Creek fisheries survey sites 354 & 406, 2013.

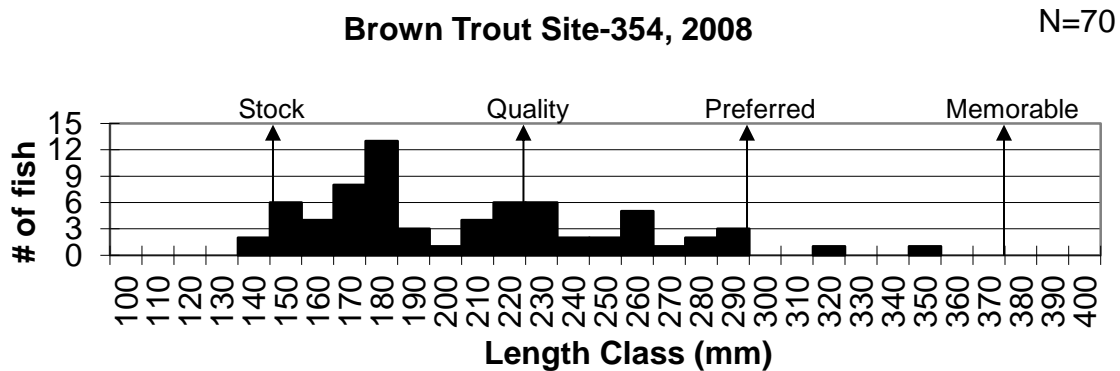


Figure 20. Brown Trout length frequency histogram for Spearfish Creek Site 354, 2008.

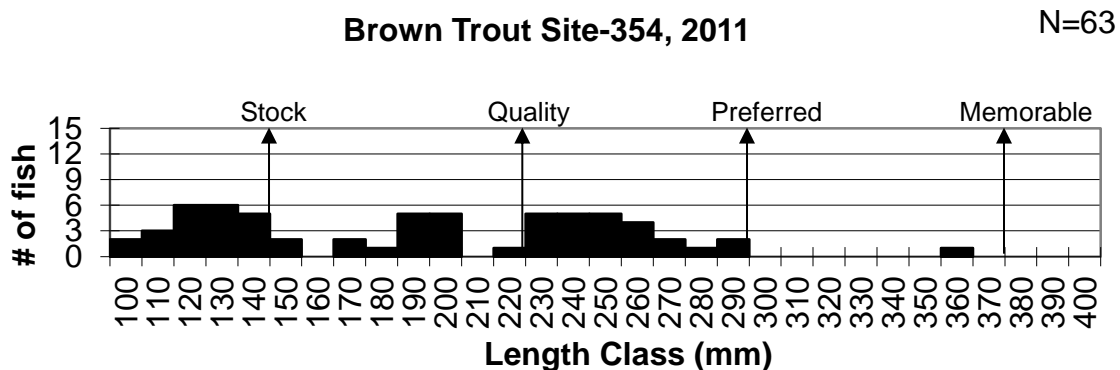


Figure 21. Brown Trout length frequency histogram for Spearfish Creek Site 354, 2011.

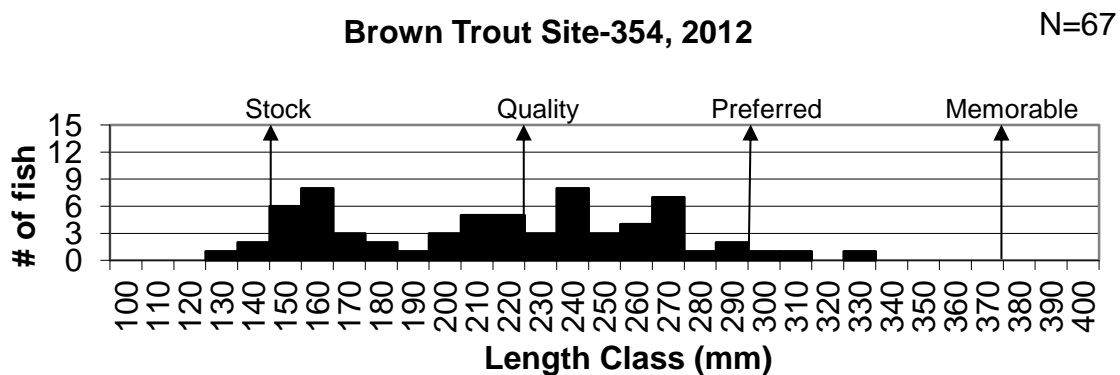


Figure 22. Brown Trout length frequency histogram for Spearfish Creek Site 354, 2012.

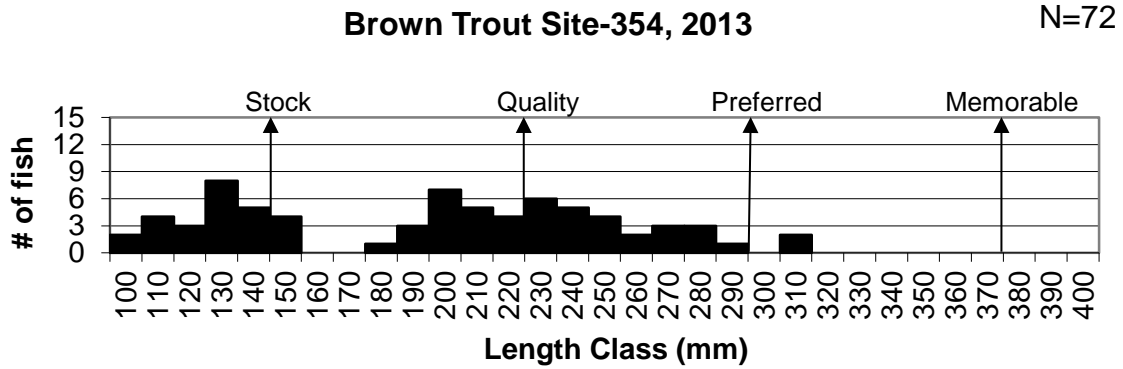


Figure 23. Brown Trout length frequency histogram for Spearfish Creek Site 354, 2013.

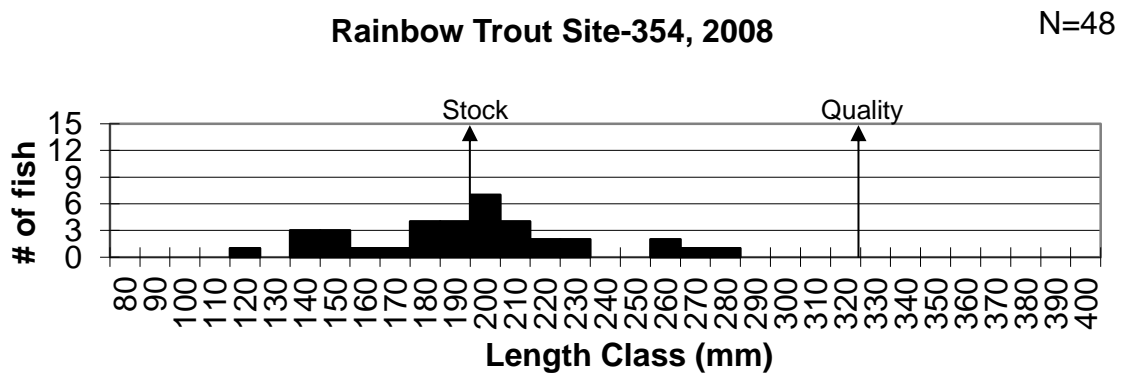


Figure 24. Rainbow Trout length frequency histogram for Spearfish Creek Site 354, 2008.

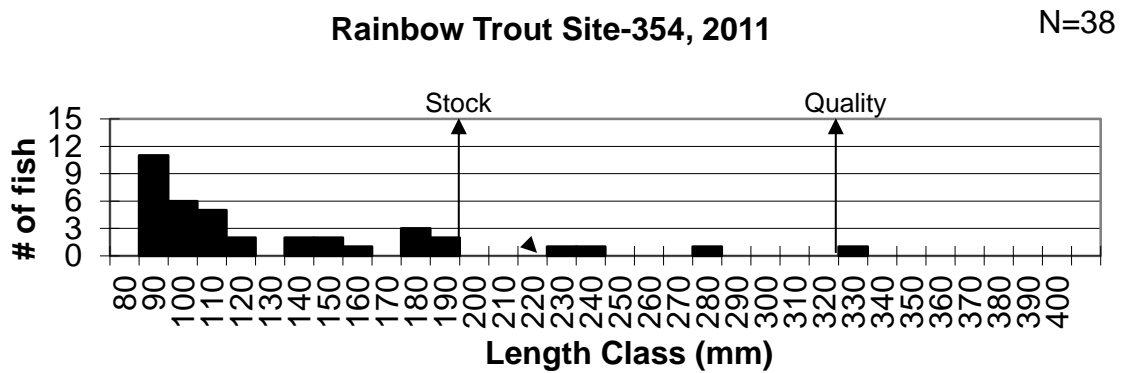


Figure 25. Rainbow Trout length frequency histogram for Spearfish Creek Site 354, 2011.

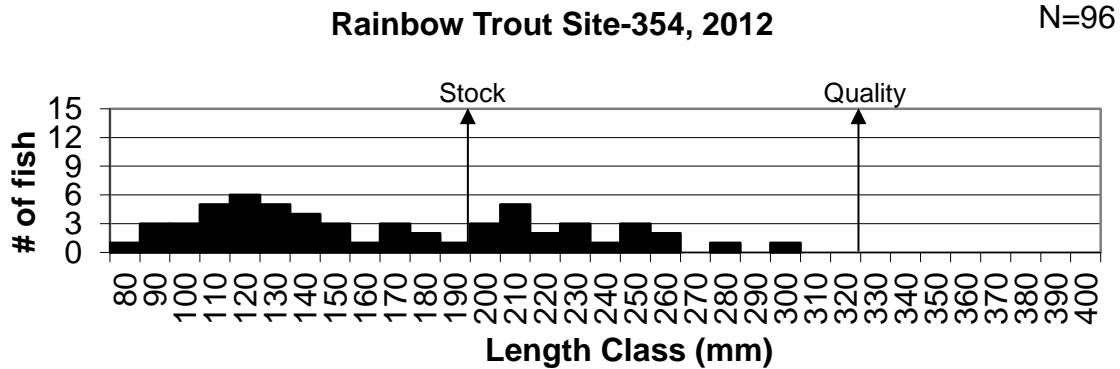


Figure 26. Rainbow Trout length frequency histogram for Spearfish Creek Site 354, 2012.

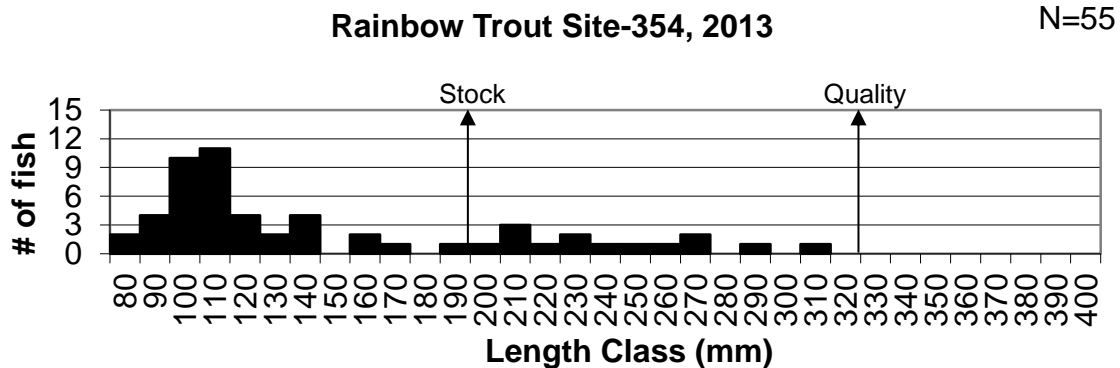


Figure 27. Rainbow Trout length frequency histogram for Spearfish Creek Site 354, 2013.

Site 406 (Longvalley picnic area)

Site 406 is located south of Victoria by the Longvalley picnic area immediately off of highway 14A (Figure 19). This site was recently surveyed on July 25, 2013. This site was also surveyed in 2008, 2011 and 2012. During the 2008 survey length and weight data were not collected due to a mishap while sampling and therefore data are not presented graphically. In 2011, 2012 and 2013, Brown Trout alone were collected at the site (Figures 5–10). Of the eight sites surveyed in 2013 Site 406 had the fourth highest abundance of Brown Trout ≥ 200 mm per 100 m of stream (Figure 3). The Brown Trout in this site appear to be exhibiting consistent recruitment (Figures 28-30). However, there are not many Brown Trout over preferred length in this site (Figures 28-30).

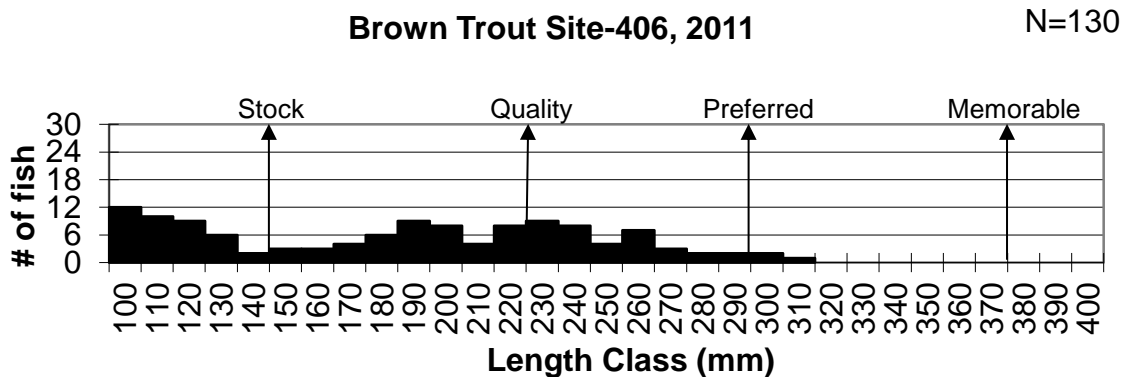


Figure 28. Brown Trout length frequency histogram for Spearfish Creek Site 406, 2011.

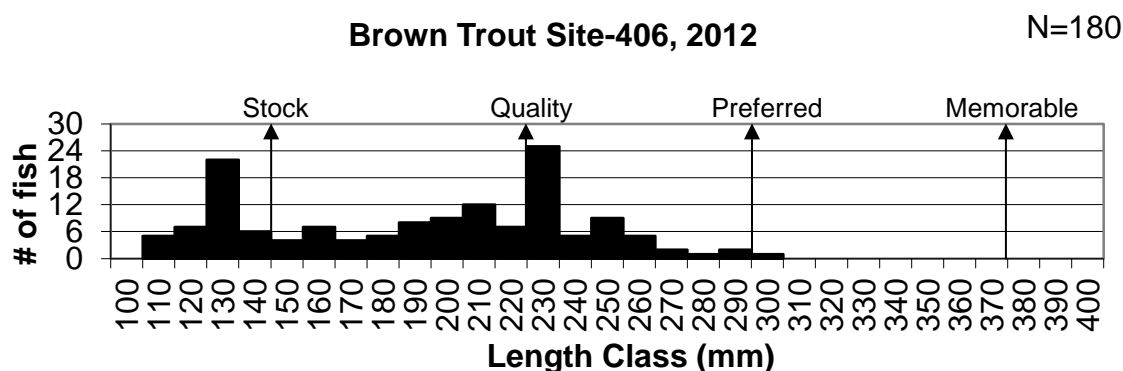


Figure 29. Brown Trout length frequency histogram for Spearfish Creek Site 406, 2012.

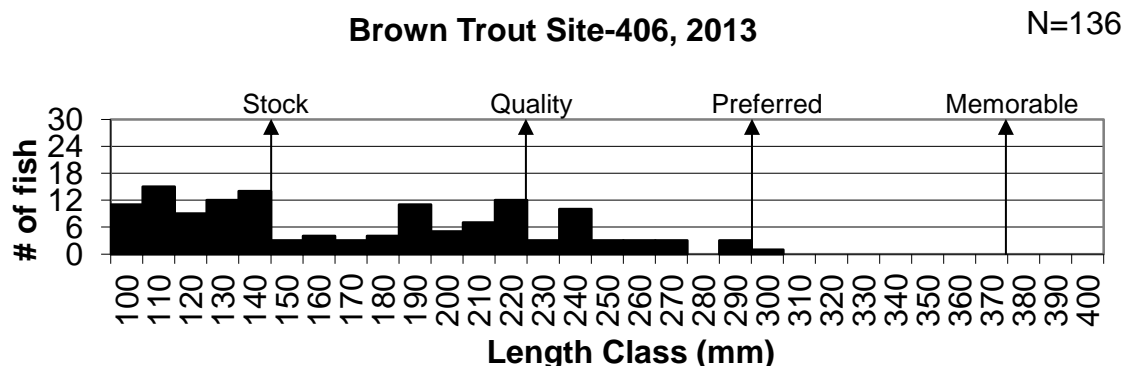


Figure 30. Brown Trout length frequency histogram for Spearfish Creek Site 406, 2013.

Site 490 (Immediately below McKinley Gulch)

Site 490 is located immediately below McKinley Gulch just off of highway 14 A (Figure 31). The site was surveyed on July 25, 2013. Site 490 has mainly held Brown Trout during the past four surveys. However, an adult Brook Trout was collected during the 2012 survey of this site. Brown Trout were the only fish species collected in 2013. Recruitment appears to be consistent for Brown Trout at this site (Figures 32-35).

Brown Trout under stock length (150 mm; 6 in) are abundant at this site while there are few fish over quality length (Figures 32-35).

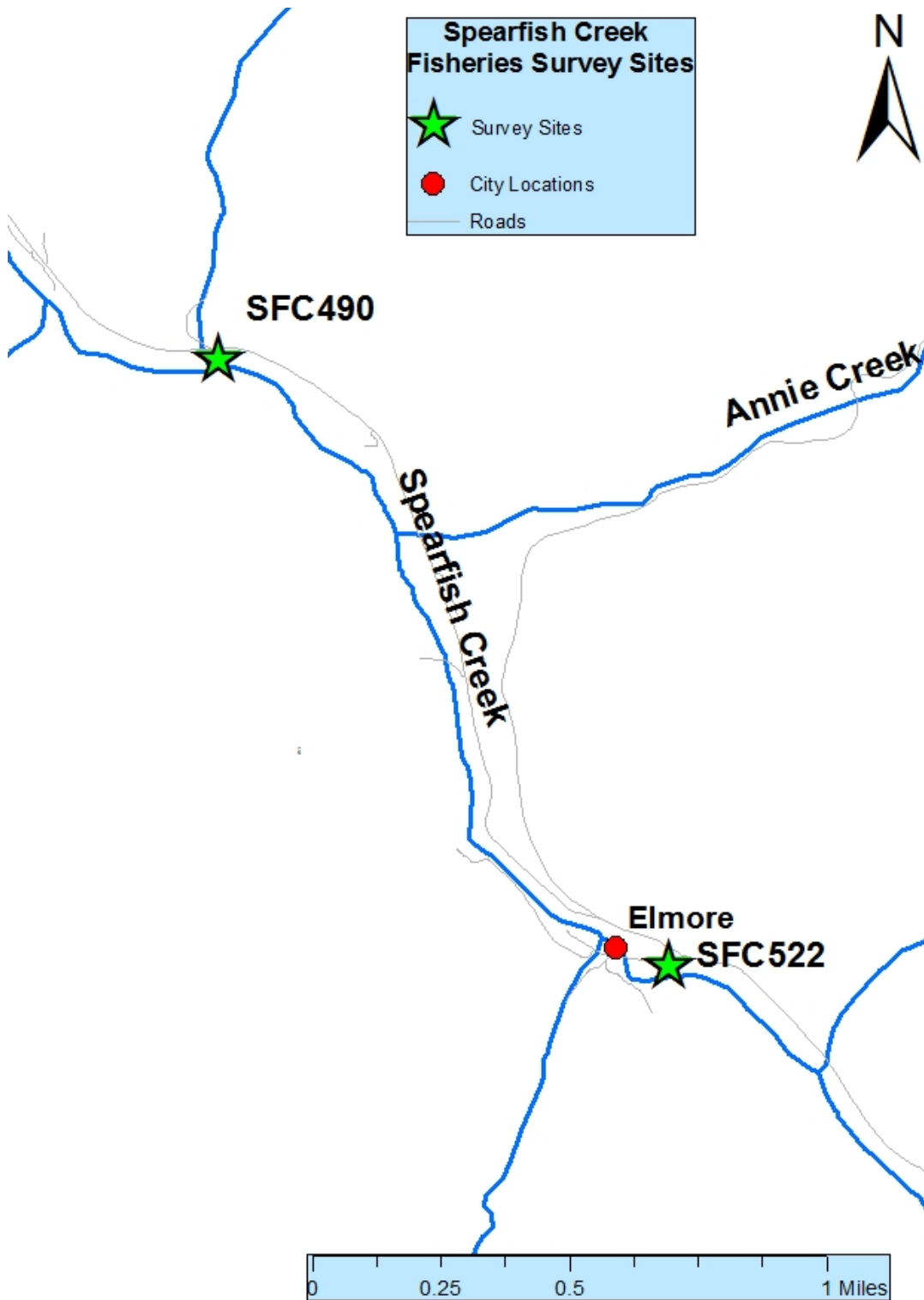


Figure 31. Spearfish Creek fisheries survey sites 490 & 522, 2013.

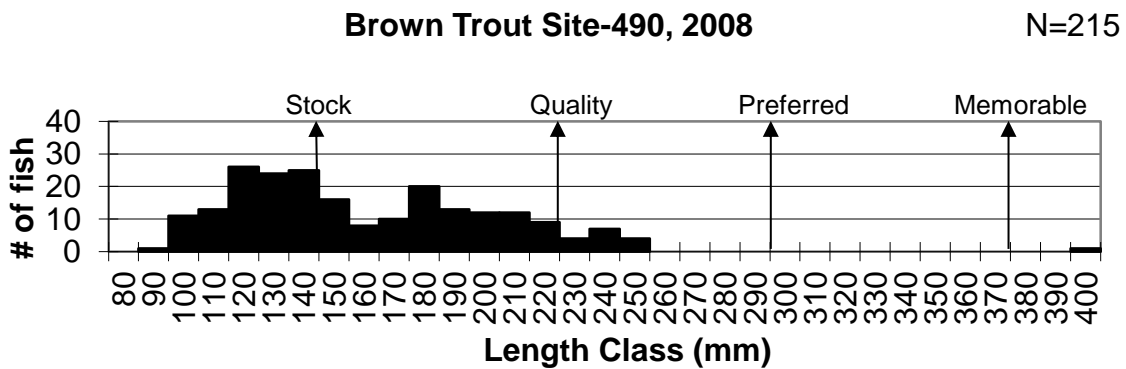


Figure 32. Brown Trout length frequency histogram for Spearfish Creek Site 490, 2008.

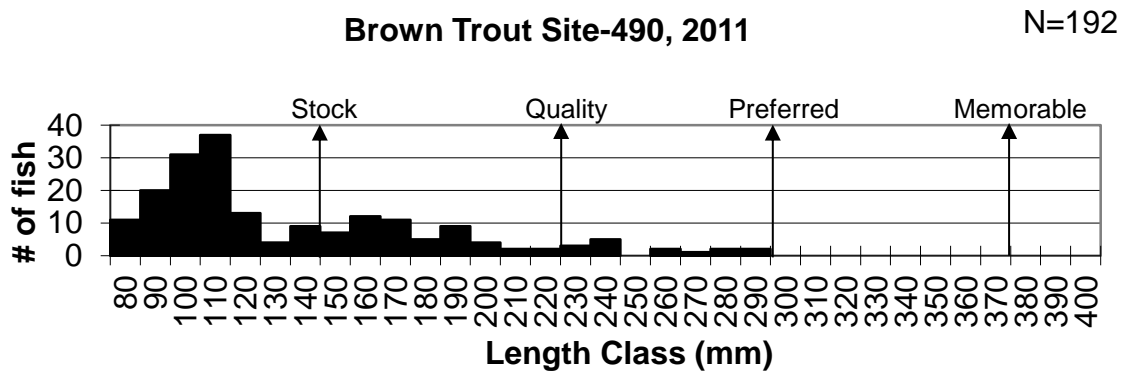


Figure 33. Brown Trout length frequency histogram for Spearfish Creek Site 490, 2011.

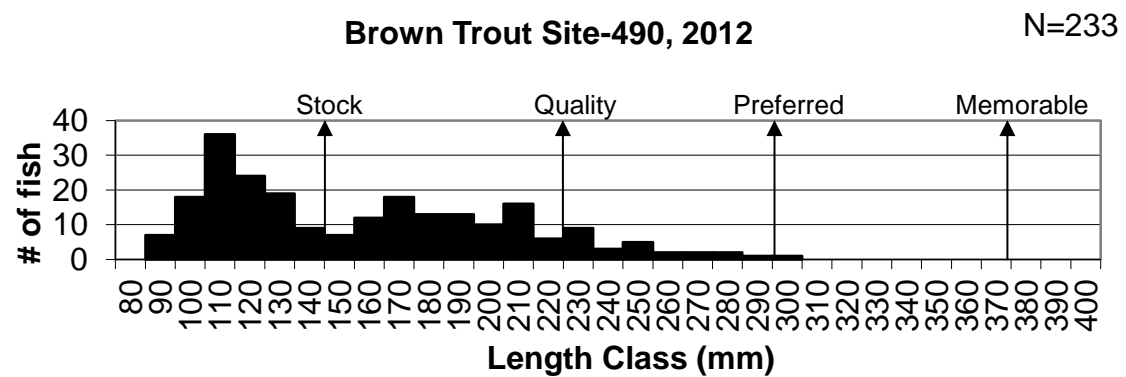


Figure 34. Brown Trout length frequency histogram for Spearfish Creek Site 490, 2012.

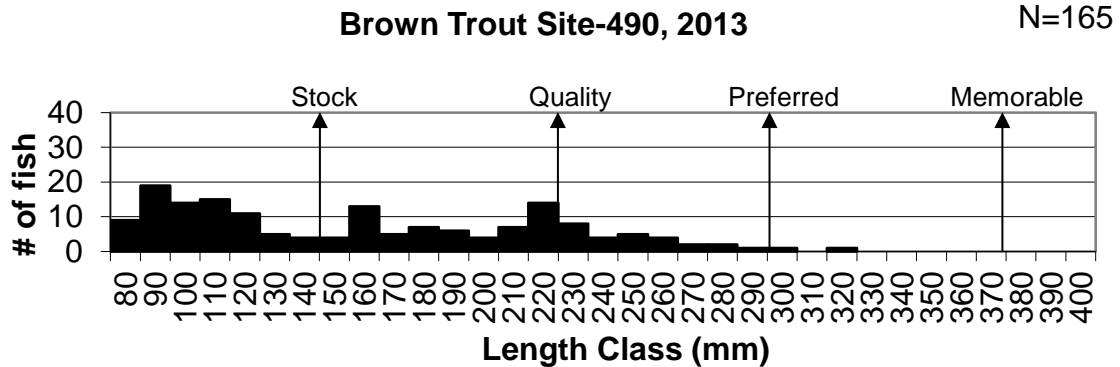


Figure 35. Brown Trout length frequency histogram for Spearfish Creek Site 490, 2013.

Site 522 (Elmore 50 m below Hwy 14A)

Site 522 is located southeast of Elmore 50 m below highway 14A (Figure 31). This site was surveyed on July 24, 2013. Site 522 had the highest population estimate of Brown Trout ≥ 200 mm of the eight sites surveyed in 2013 (Figure 3). There are a large portion of Brown Trout under stock length as well at this site (Figures 36-38). Recruitment appears to be consistent in this site as well (Figures 36-38). There is also a portion of the Brown Trout population exceeding quality (230 mm; 9 in) and a few fish over preferred (30 mm; 12 in) length at this site (Figures 36-38).

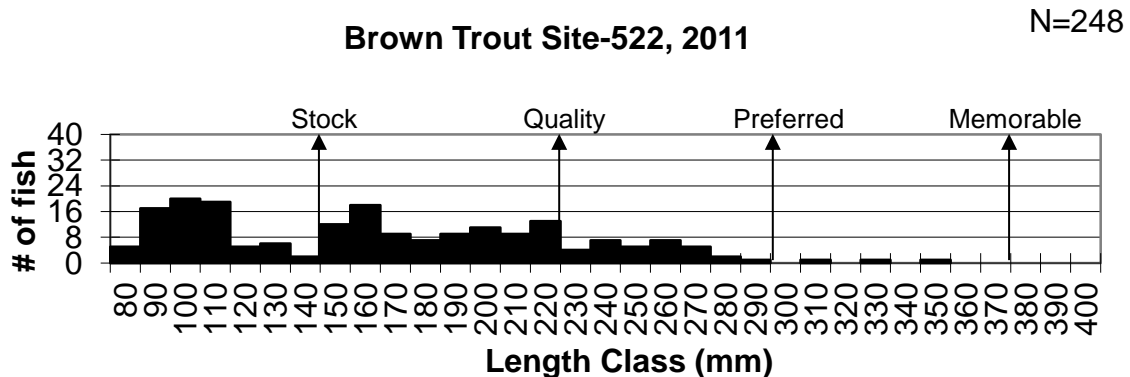


Figure 36. Brown Trout length frequency histogram for Spearfish Creek Site 522, 2011.

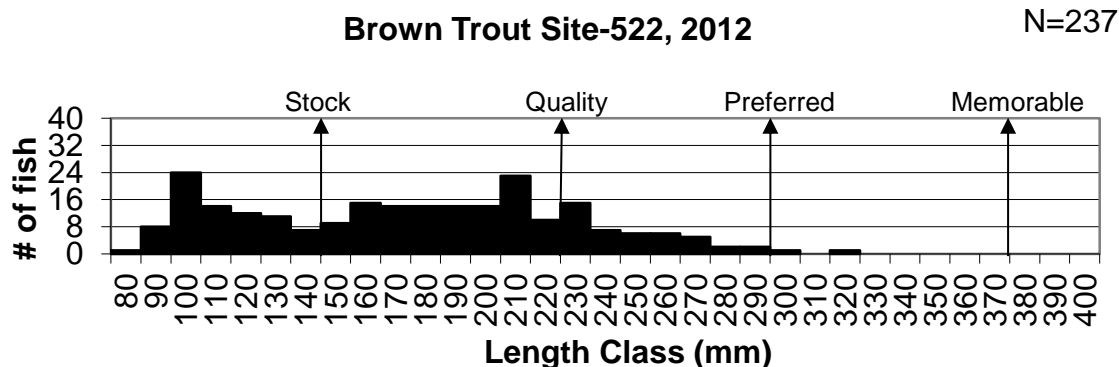


Figure 37. Brown Trout length frequency histogram for Spearfish Creek Site 522, 2012.

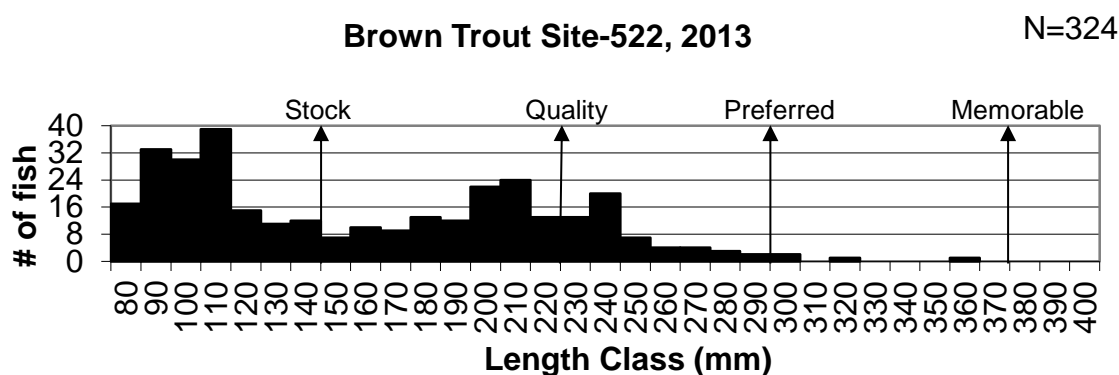


Figure 38. Brown Trout length frequency histogram for Spearfish Creek Site 522, 2013.

Site 585 (At a pullout)

Site 585 is located southwest of Cheyenne Crossing near a road pullout off of Highway 85 (Figure 39). This site was surveyed on July 23, 2013. Most of the Brown Trout were <200 mm (Figures 40-42). A large sample (n=270) of Brown Trout (not including age-0 fish) were collected during this survey (Figure 42). Brook Trout were the only other fish species collected at this site during the past three surveys. There were only a couple Brook Trout collected in 2011, 2012, and 2013 and they were all less than 200 mm. There are not many Brown Trout over quality length at this site (Figures 40-42). The population estimate for Brown trout over 200 mm has increased slightly from 2012 to 2013 (Figure 3).

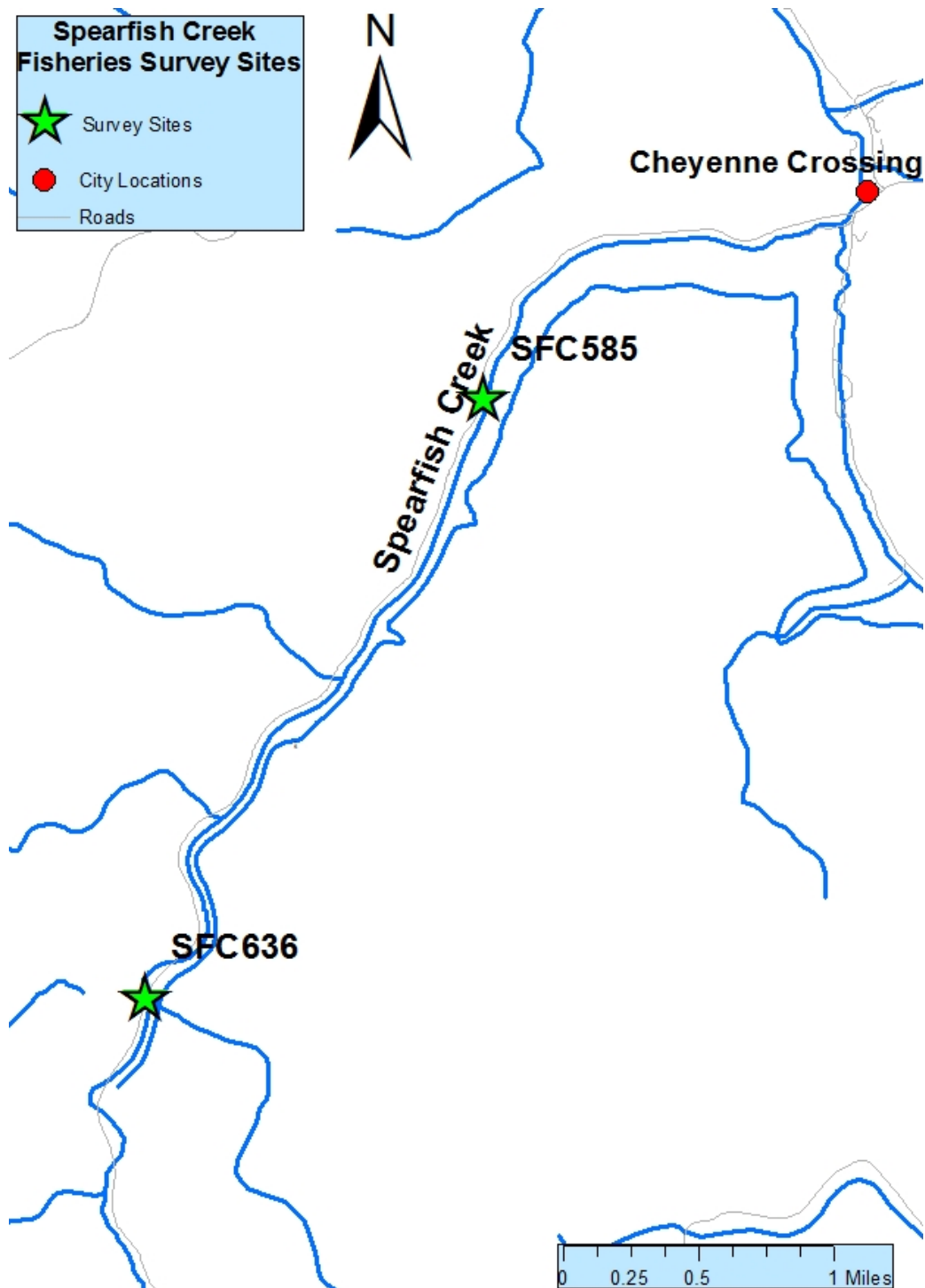


Figure 39. Spearfish Creek fisheries survey sites 585 and 636, 2013.

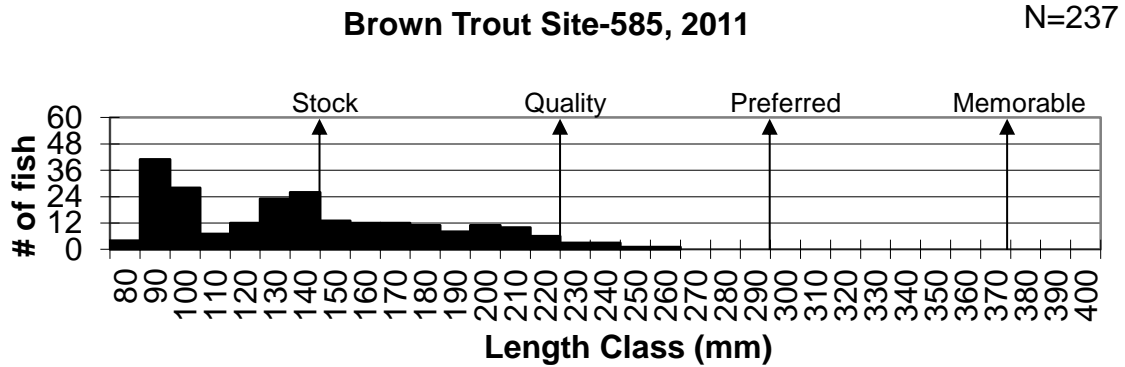


Figure 40. Brown Trout length frequency histogram for Spearfish Creek Site 585, 2011.

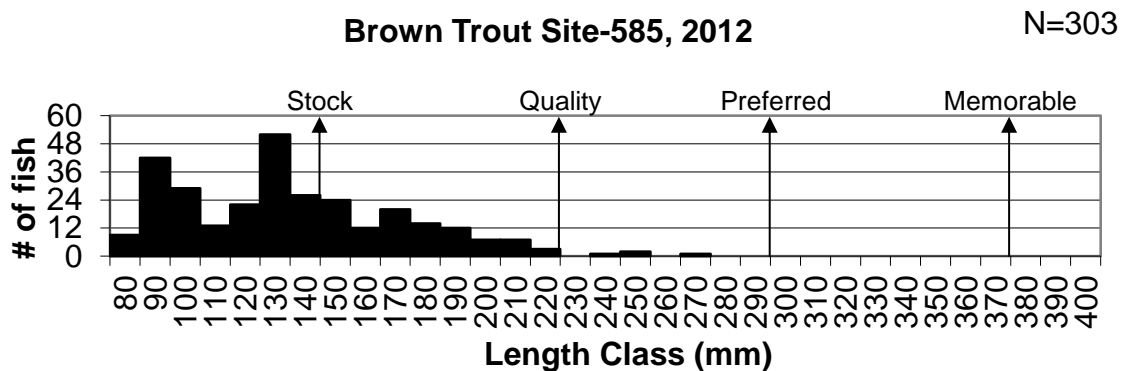


Figure 41. Brown Trout length frequency histogram for Spearfish Creek Site 585, 2012.

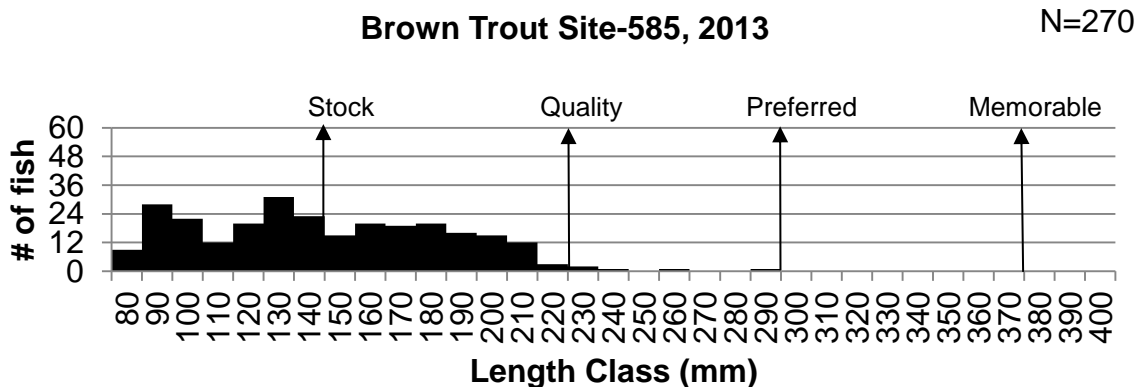


Figure 42. Brown Trout length frequency histogram for Spearfish Creek Site 585, 2013.

Site 636 (0.6 mi up from Dead Ox picnic area)

Site 636 is a historical site located 0.6 mi upstream from the Dead Ox picnic area near the headwaters of Spearfish Creek (Figure 39). This site was surveyed on July 23, 2013. Site 636 contains a population of Brown Trout and Brook Trout. Abundances for Brook Trout <200 mm and ≥200 mm appear highest in 2012 of the past three surveys (Figures 6 and 7). It also appears that the sizes of Brown Trout have increased at Site

636 from 2011 to 2012 with several year classes present (Figures 43-46). However, the increase in Brown Trout does not seem to have substantially reduced the population of Brook Trout (Figures 6 and 7). It does appear that the Brook Trout population is down slightly from 2012 to 2013. The Brook Trout population appears to be exhibiting consistent recruitment (Figures 47-50).

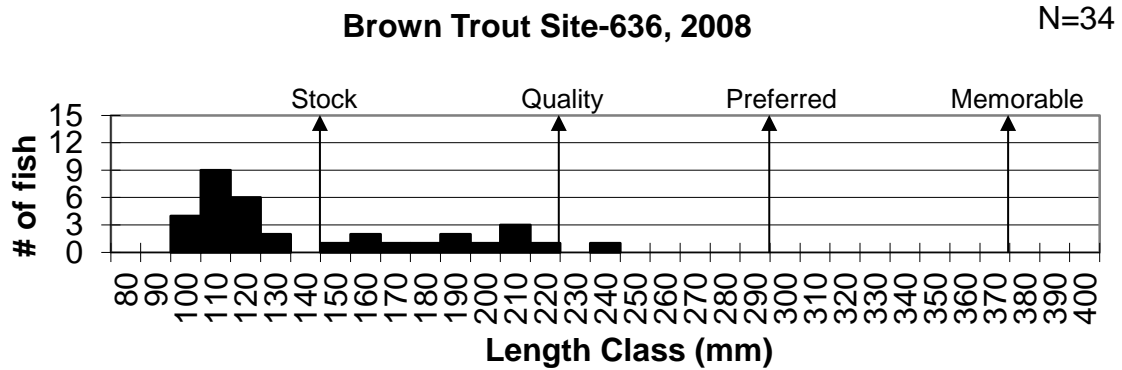


Figure 43. Brown Trout length frequency histogram for Spearfish Creek Site 636, 2008.

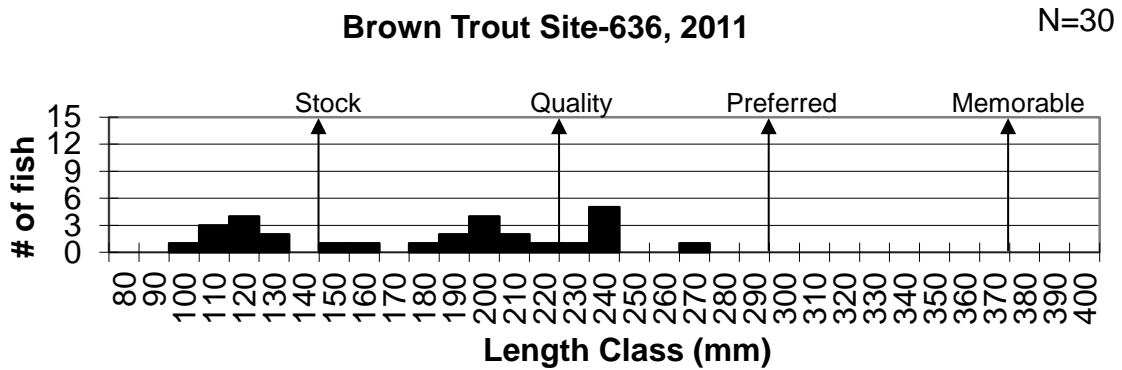


Figure 44. Brown Trout length frequency histogram for Spearfish Creek Site 636, 2011.

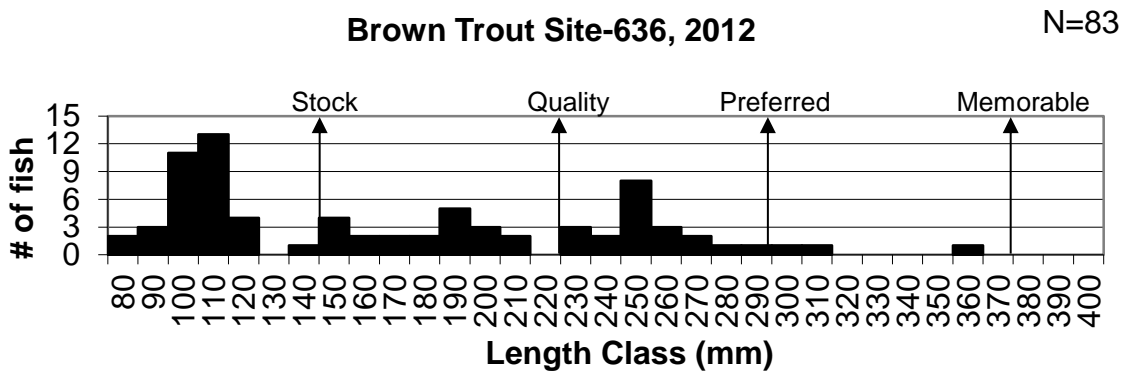


Figure 45. Brown Trout length frequency histogram for Spearfish Creek Site 636, 2012.

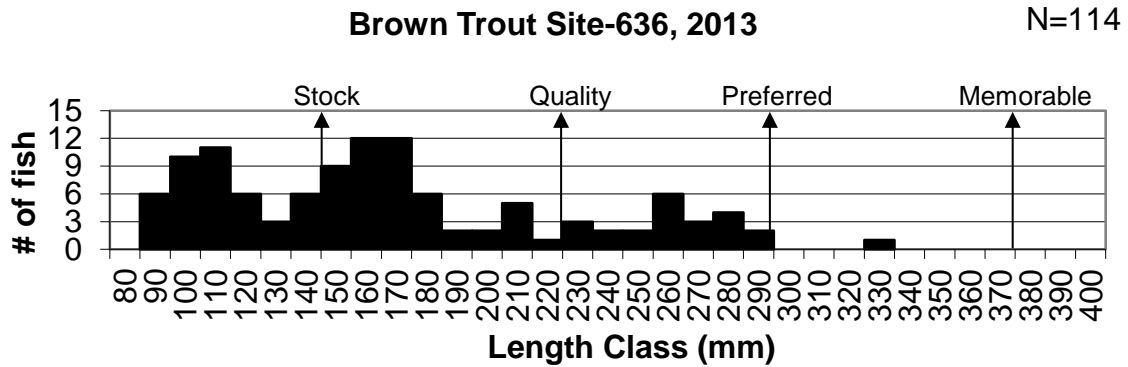


Figure 46. Brown Trout length frequency histogram for Spearfish Creek Site 636, 2013.

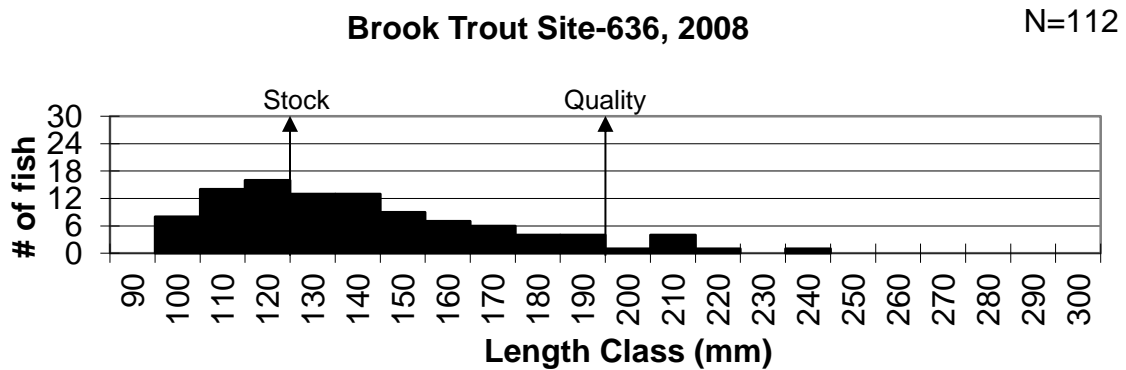


Figure 47. Brook Trout length frequency histogram for Spearfish Creek Site 636, 2008.

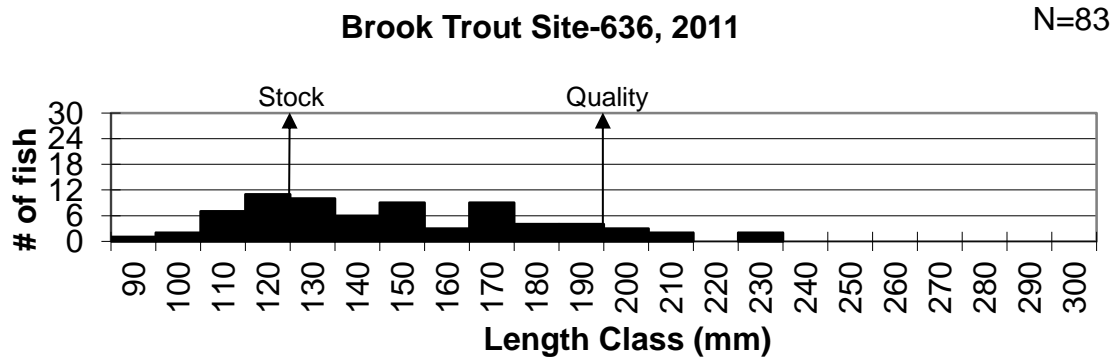


Figure 48. Brook Trout length frequency histogram for Spearfish Creek Site 636, 2011.

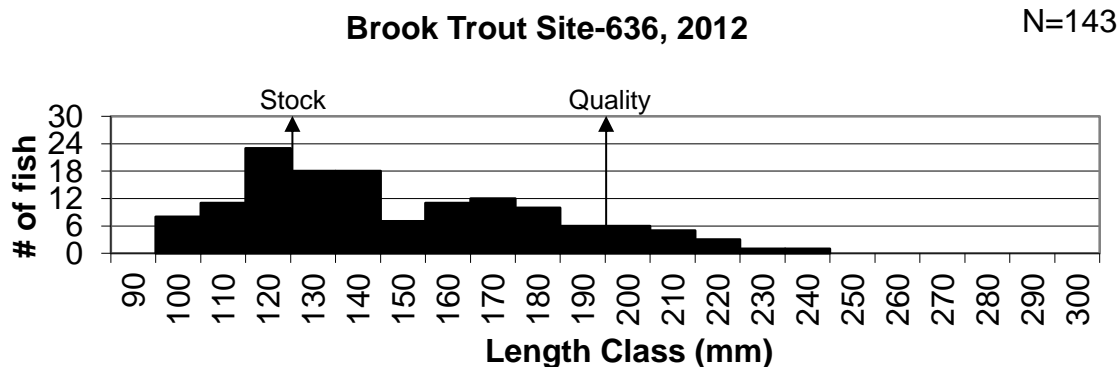


Figure 49. Brook Trout length frequency histogram for Spearfish Creek Site 636, 2012.

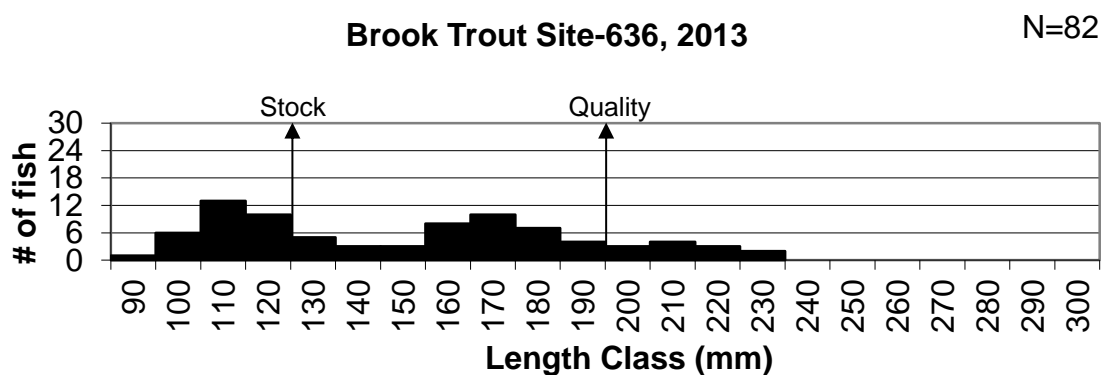


Figure 50. Brook Trout length frequency histogram for Spearfish Creek Site 636, 2013.

MANAGEMENT RECOMMENDATIONS

1. Continue monitoring selected survey sites annually to ensure there are no current or potential problems with the fishery.
2. Conduct an intensive survey every 3 to 5 years as a thorough evaluation of the fishery.
3. Monitor the effects of changing water yield (drought or heavy precipitation events) on the fishery.

Appendix A. Spearfish Creek survey site characteristics 2013.

Site #	189	220	354	406	490	522	585	636
Site Length (m)	100	100	100	100	100	100	100	100
Mean Width (m)	7	7.1	9.5	9.1	6.9	6.4	5.4	3.3
Water Temp (C)	12.7	12.8	15.7	12.9	14.3	NA	9.2	11.2
pH	NA	NA	8.6	8.3	NA	NA	NA	8
Conductivity (umhos/cm)	466	430	387	419	404	NA	475	443
Passes (#)	3	3	3	3	3	3	3	3

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- Van Den Avyle, M. J. and R. S. Hayward. 1999. Dynamics of exploited fish populations. Pages 127-166 *in* C. C. Kohler and W. A. Hubert, editors. Inland fisheries management in North America, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Table 1. Population and Biomass Estimates for Spearfish Creek.

Site Number: 189 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: West of High School (Picnic Area) (historic 1)
 Legal Description: S10,R2E,T6N
 Stream Classification: BNT1

Date Sampled: 22 JUL 2013 Conductivity (µmhos): 466
 Site Length (m): 100 pH: ****
 Mean Width (m): 7.0 Water Temperature (°C): 12.7
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	19	22	19	30	316	14.69	220	128	13.12	354	102.9	46.5	1.15
Brown Trout	≥200 mm	60	62	60	66	890	201.99	620	361	180.35	998	282.4	226.9	0.99
Brown Trout	ALL	79	83	79	90	1,192	245.11	830	483	218.85	1,335	239.3	205.6	1.01
Creek Chub	ALL	1	1	1	2	14	0.22	10	6	0.19	16	116.0	15.0	0.96

Site Number: 220 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: City Campground
 Legal Description: S15,R2E,T6N
 Stream Classification: BNT1 RBT2

Date Sampled: 22 JUL 2013 Conductivity (µmhos): 430
 Site Length (m): 100 pH: ****
 Mean Width (m): 7.1 Water Temperature (°C): 12.8
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	114	117	114	122	1,656	69.04	1,170	671	61.64	1,883	83.6	41.7	1.15
Brown Trout	≥200 mm	38	38	38	40	538	106.77	380	218	95.33	611	269.1	198.5	1.00
Brown Trout	ALL	152	155	152	160	2,194	298.99	1,550	889	266.96	2,494	130.0	136.3	1.06
Rainbow Trout	≥200 mm	1	1	1	2	14	3.11	10	6	2.78	16	275.0	220.0	1.06
Rainbow Trout	ALL	1	1	1	2	14	3.11	10	6	2.78	16	275.0	220.0	1.06

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 354 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: 354-Below Squaw Creek Confluence
 Legal Description: S17,R2E,T5N
 Stream Classification: BNT1 RBT1

Date Sampled: 24 JUL 2013 Conductivity (µmhos): 387
 Site Length (m): 100 pH: ****
 Mean Width (m): 9.5 Water Temperature (°C): 15.7
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	34	39	34	49	410	13.68	390	166	12.22	628	131.0	33.4	1.12
Brown Trout	≥200 mm	42	44	42	49	463	68.32	440	187	61.00	708	241.7	147.6	1.00
Brown Trout	ALL	76	84	76	95	883	88.36	840	358	78.90	1,352	192.2	100.0	1.05
Rainbow Trout	<200 mm	41	44	41	50	463	11.46	440	187	10.23	708	117.9	24.8	1.26
Rainbow Trout	≥200 mm	14	14	14	16	147	24.28	140	60	21.68	225	247.2	164.9	1.05
Rainbow Trout	ALL	55	59	55	66	620	40.22	590	251	35.91	949	150.8	64.8	1.20

Site Number: 406 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: 406-Longvalley Picnic Area
 Legal Description: S00,R00E,T
 Stream Classification: BNT1

Date Sampled: 25 JUL 2013 Conductivity (µmhos): 419
 Site Length (m): 100 pH: 8.3
 Mean Width (m): 9.1 Water Temperature (°C): 12.9
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	105	146	105	191	1,603	52.82	1,460	649	47.16	2,349	128.0	33.0	1.03
Brown Trout	≥200 mm	50	54	50	61	593	84.04	540	240	75.03	869	238.3	141.8	1.02
Brown Trout	ALL	155	196	161	231	2,152	156.98	1,960	871	140.16	3,154	163.6	73.0	1.03

Site Number: 490 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: 490-Immediately below McKinley Gulch(old site 15)
 Legal Description: S5,R2E,T4N
 Stream Classification: BNT1

Date Sampled: 25 JUL 2013 Conductivity (µmhos): 404
 Site Length (m): 100 pH: ****
 Mean Width (m): 6.9 Water Temperature (°C): 14.3
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	139	148	139	158	2,134	69.47	1,480	864	62.03	2,381	112.3	32.6	1.04
Brown Trout	≥200 mm	53	54	53	57	779	108.21	540	315	96.62	869	238.5	139.0	1.03
Brown Trout	ALL	192	202	192	212	2,912	225.34	2,020	1,179	201.20	3,250	147.1	77.4	1.03

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 522 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: 522-Elmore 50m below Hwy 14A
 Legal Description: S9,R2E,T50
 Stream Classification: BNT1

Date Sampled: 24 JUL 2013 Conductivity (µmhos): ****
 Site Length (m): 100 pH: ****
 Mean Width (m): 6.4 Water Temperature (°C): ****
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	237	262	244	280	4,111	137.19	2,620	1,665	122.49	4,216	116.7	33.4	1.10
Brown Trout	≥200 mm	116	122	116	130	1,914	267.60	1,220	775	238.94	1,963	233.9	139.8	1.02
Brown Trout	ALL	353	385	365	405	6,041	502.70	3,850	2,447	448.84	6,195	155.2	83.2	1.06

Site Number: 585 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: SFC585-@ a pullout
 Legal Description: S20,R2E,T4
 Stream Classification: BKT0 BNT1

Date Sampled: 23 JUL 2013 Conductivity (µmhos): 475
 Site Length (m): 100 pH: ****
 Mean Width (m): 5.4 Water Temperature (°C): 9.2
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brook Trout	<200 mm	2	2	2	2	37	0.49	20	15	0.43	32	107.0	13.0	1.06
Brook Trout	ALL	2	2	2	2	37	0.49	20	15	0.43	32	107.0	13.0	1.06
Brown Trout	<200 mm	238	244	238	251	4,557	184.83	2,440	1,846	165.03	3,926	138.9	40.6	1.10
Brown Trout	≥200 mm	35	35	35	37	654	69.96	350	265	62.47	563	216.4	107.0	1.03
Brown Trout	ALL	273	280	273	287	5,229	271.79	2,800	2,118	242.67	4,505	148.8	52.0	1.08

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 636 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: 636-0.6 mi up from Dead Ox Picknic
 Legal Description: S00,R00E,T
 Stream Classification: BKT2 BNT1

Date Sampled: 23 JUL 2013 Conductivity (µmhos): 443
 Site Length (m): 100 pH: 8.0
 Mean Width (m): 3.3 Water Temperature (°C): 11.2
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brook Trout	<200 mm	72	114	72	175	3,436	126.49	1,140	1,391	112.94	1,834	142.0	36.8	1.10
Brook Trout	≥200 mm	12	12	12	14	362	38.33	120	146	34.23	193	216.2	106.0	1.04
Brook Trout	ALL	84	121	84	167	3,647	170.73	1,210	1,477	152.44	1,947	152.6	46.8	1.09
Brown Trout	<200 mm	85	400	85	1,565	12,055	441.53	4,000	4,882	394.23	6,436	140.2	36.6	1.12
Brown Trout	≥200 mm	31	38	31	52	1,145	210.87	380	464	188.28	611	253.5	184.1	1.09
Brown Trout	ALL	116	283	116	561	8,529	654.47	2,830	3,454	584.36	4,553	170.4	76.7	1.11